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Using language for social interaction: Communication mechanisms promote recovery from chronic non-fluent aphasia

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ABSTRACT

Introduction: Clinical research highlights the importance of massed practice in the rehabilitation of chronic post-stroke aphasia. However, while necessary, massed practice may not be sufficient for ensuring progress in speech-language therapy. Motivated by recent advances in neuroscience, it has been claimed that using language as a tool for communication and social interaction leads to synergistic effects in left perisylvian eloquent areas. Here, we conducted a crossover randomized controlled trial to determine the influence of communicative language function on the outcome of intensive aphasia therapy.

Methods: Eighteen individuals with left-hemisphere lesions and chronic non-fluent aphasia each received two types of training in counterbalanced order: (i) Intensive Language-Action Therapy (ILAT, an extended form of Constraint-Induced Aphasia Therapy) embedding verbal utterances in the context of communication and social interaction, and (ii) Naming Therapy focusing on speech production *per se*. Both types of training were delivered with the same high intensity (3.5 h per session) and duration (six consecutive working days), with therapy materials and number of utterances matched between treatment groups.

Results: A standardized aphasia test battery revealed significantly improved language performance with ILAT, independent of when this method was administered. In contrast, Naming Therapy tended to benefit language performance only when given at the onset of the treatment, but not when applied after previous intensive training.

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Conclusions: The current results challenge the notion that massed practice alone promotes recovery from chronic post-stroke aphasia. Instead, our results demonstrate that using language for communication and social interaction increases the efficacy of intensive aphasia therapy.

1. Introduction

After decades of debate on the success of speech-language therapy (SLT) in neurological patients (Lincoln, McGuirk, Mulley, Jones, & Mitchell, 1984), clinical research has confirmed the relative efficacy of intensive regimes in the rehabilitation of chronic post-stroke aphasia (Brady, Kelly, Godwin, Enderby, & Campbell, 2016). In particular, a series of randomized controlled trials (RCTs) demonstrated the short- and long-term benefit from Intensive Language-Action Therapy (ILAT), an extended form of Constraint-Induced Aphasia Therapy, even if delivered years following the onset of the disease (Meinzer, Djundja, Barthel, Elbert, & Rockstroh, 2005; Pulvermüller et al., 2001; Szaflarski et al., 2015). Apart from its high intensity with up to 30 h of practice in less than two weeks, ILAT emphasizes the training of language skills in the context of communication and social interaction (Difrancesco, Pulvermüller, & Mohr, 2012).

Motivation for ILAT comes from linguistic theory, stating that the primary function of language emerges from its everyday use (Tomasello, 2005; Wittgenstein, 1953), and from neuroscience data. Crucially, recent studies revealed an increase of brain activity with communicative function, showing that requesting objects from a person elicits stronger neurophysiological and neuroimaging responses in cortical language and motor regions than picture naming performed with the same verbal utterances (Egorova, Pulvermüller, & Shtyrov, 2014; Egorova, Shtyrov, & Pulvermüller, 2013; Egorova, Shtyrov, & Pulvermüller, 2016). Further neuroscience evidence suggests that the neural bases of language and action are functionally interlinked (e.g., Glenberg, Sato, & Cattaneo, 2008; Pulvermüller, Hauk, Nikulin, & Ilmoniemi, 2005; Willems, Labruna, D'Esposito, Ivry, & Casasanto, 2011). Therefore, it has been argued that the co-activation of these neural systems potentially leads to synergistic effects (Pulvermüller & Fadiga, 2010), which might improve the outcome of SLT if verbal utterances are embedded in behaviorally relevant settings (Berthier & Pulvermüller, 2011). Still, the major variable currently seen as essential for the success of SLT in general, and ILAT in particular, is the intensity of the treatment, while the role of communication and social interaction remains not fully understood (Cherney, Patterson, Raymer, Frymark, & Schooling, 2008).

The present crossover RCT seeks to determine the impact of communication and social interaction on the efficacy of intensive SLT. Individuals with chronic non-fluent aphasia each received two types of intensive training in counterbalanced order: communicative-pragmatic action-embedded therapy focusing on verbal requests (ILAT), and utterance-centered confrontation naming (Naming Therapy). The design controlled for the influence of training intensity and duration, with therapy materials and number of utterances matched between treatment groups. According to traditional views in aphasia rehabilitation, the ability to name objects may be a precondition for successful communication, hence predicting that Naming Therapy should yield greater progress than ILAT (Shewan & Bandur, 1986). Conversely, linguistic theory and neuroscience data summarized above suggest that embedding verbal utterances in communication and social interaction may be key to facilitating language processing in left perisylvian eloquent areas, thus predicting better outcomes with ILAT than Naming Therapy.

2. Methods

2.1. Participants

Eighteen patients with a neurological diagnosis of chronic aphasia were eligible and agreed to participate in the current crossover RCT (for details, see Fig. 1). This sample size was consistent with a previous power analysis ($\alpha = .05$; $1-\beta = .95$; number of groups: 2; number of repeated measures: 3; estimated Cohen's $f = .4$, derived from Pulvermüller et al., 2001, and equivalent to an increase of two points per training period on our standardized aphasia test battery; cf. Faul, Erdfelder, Buchner, & Lang, 2009). All patients were native speakers of German who had not received intensive SLT in the year prior to inclusion in the study. Patients were aged 32–73 years (mean age: 51 years; standard deviation: 12 years) and right-

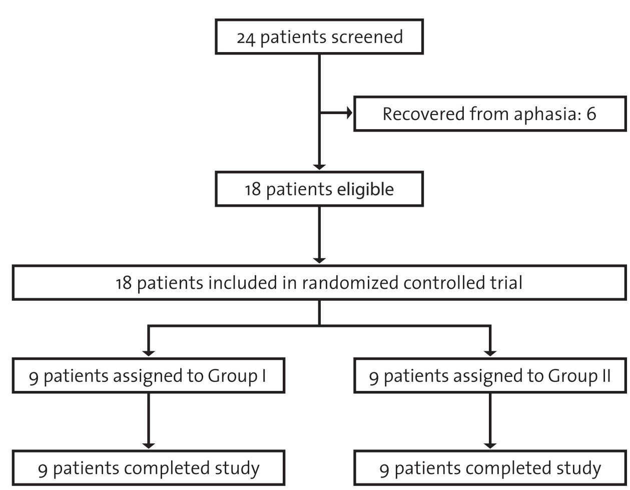

Fig. 1 – CONSORT flow diagram.